

# **Aquaculture Biotechnology**

## **Introduction and Scope**

# Introduction

- ✓ **Aquaculture** is farming of fish and other aquatic animals and plants in either saltwater or freshwater environment
- ✓ **Aquaculture Biotechnology** deals with the applications of genetic, cellular, and molecular technologies to enable farmers to produce more abundant, resilient, and healthier supply of aquatic animals/ fish.



# Introduction

- ✓ Biotechnology provides powerful tools for the **sustainable** development of aquaculture.
- ✓ **Increased public demand** for seafood and decreasing natural marine habitats have encouraged scientists to study ways that biotechnology can **increase the production** of marine food products, and making aquaculture as a growing field of animal research.
- ✓ Biotechnology allows scientists to identify and **combine traits in fish** and shellfish to increase productivity and **improve quality**.

# Importance of Aquaculture

- ❑ In Pakistan fisheries and aquaculture is an important sector of food production
- ❑ It provides nutritional security to the food basket
- ❑ contributes to the agricultural exports
- ❑ engaging a large population in different activities.

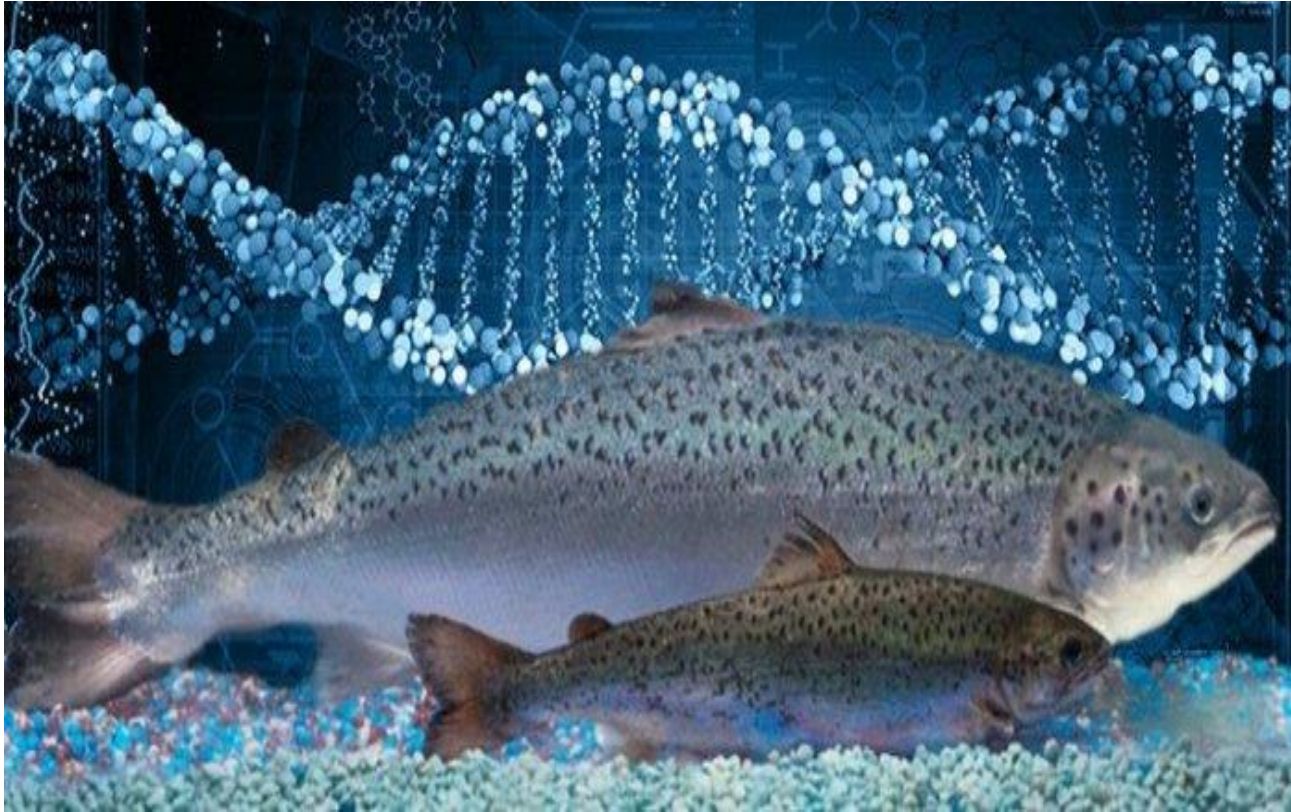
# Importance of Aquaculture

- ✓ Scientists are investigating genes that will increase **production of natural fish growth factors** as well as the natural **defense compounds** marine organisms use to fight microbial infections.
- ✓ **Modern biotechnology** is already making important contributions and poses significant challenges to aquaculture and fisheries development.
- ✓ The use of modern biotechnology to enhance production of aquatic species holds great potential not only to meet demand but also to improve aquaculture.

# Importance of Aquaculture

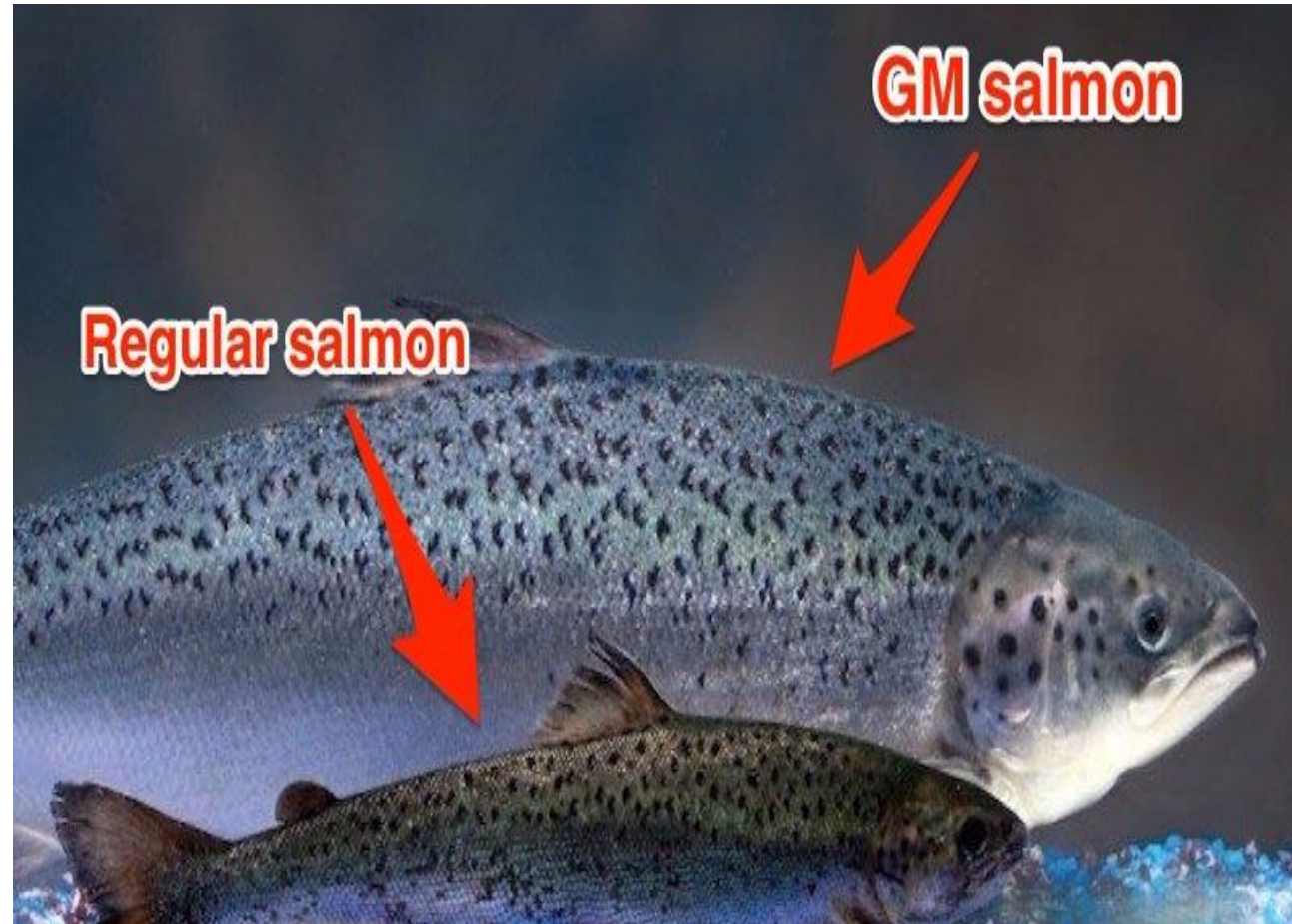
- Genetic modification and biotechnology also holds tremendous potential to improve the **quality and quantity of fish** reared in aquaculture.
- There is a **growing demand for aquaculture**; biotechnology can help to meet this demand.
- As with all biotech-enhanced foods, aquaculture will be **strictly regulated** before **approved for market**.

# Genetic Engineering in fish



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# IT WAS THIS BIG! HOW GM SALMON IS ENGINEERED



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- However, benefits offered by the new technologies cannot be fulfilled without a continued commitment to

## Basic research.

- Biotechnological programmes must be fully integrated into a research background
- They cannot be taken out of context if they are to succeed.

# Collaboration with other fields

Successful development and application of biotechnology are possible only when a broad research and knowledge of the following fields exists.

- ✓ Biology
- ✓ Variation
- ✓ Breeding
- ✓ Agronomy
- ✓ Physiologypathology
- ✓ Biochemistry
- ✓ genetics of the manipulated organism exists.

The key facets of the culture cycle (growth, nutrition, health and reproduction) can be optimized through biotechnological applications including:

- ✓ enhancement of growth rate
- ✓ feed conversion efficiency
- ✓ nutrition and product quality
  - ✓ stress modulation

The key facets of the culture cycle (growth, nutrition, health and reproduction) can be optimized through biotechnological applications including:

- ✓ vaccination,
- ✓ disease resistance
- ✓ modern disease diagnostics
  - ✓ and treatment
- ✓ genetic selection
- ✓ transgenesis

# Benefits of Aquaculture Biotechnology

- Aquatic Biotechnology having both basic and spin off applications, can play pivotal roles in promoting productivity, boosting efficiency, and ensuring sustainability in aquaculture.
- The genomics and proteomics have the potential to impact production and management of fish genetic resources.
- The tinkering technique of genetic "cut, copy and paste" can add novel traits of enhanced growth, cold tolerance, disease resistance, etc in the genetically modifies (transgenic) fishes.

Transgenic improvement:  
Salmon, trout



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Transgenic Pet Fish\_Spectrum  
expands



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